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TITLE OF INVESTIGATION: Mapping islands, reefs and shoals in the oceans surrounding Australia.

INVESTIGATION NUMBER: 2896B

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SECOND QUARTERLY REPORT

PERIOD: 8 November 1975 to 8 February 1976.

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II. Techniques

Some improvements have been made to the methods of undertaking geometric distortion tests on the LANDSAT imagery:

- i) Whenever possible, ground control points should be selected from 1:100 000 scale topographic maps, rather than selected from available survey control points. The former will often be cultural features, such as roads and airfields, whereas the latter, which were used in earlier tests, were rarely located at sites which could conveniently be identified on satellite imagery.
- ii) As the above method of identifying ground control points is only usable for areas for which maps are now available, it is useful for distortion testing but not for mapping of new areas. For the production of maps in such new areas, surveyed control points may be needed on the ground. It seems that these should, if possible, be specially placed, after the imagery has been obtained, i.e. the ground points should be firstly selected from the imagery and then, secondly, co-ordinated.
- iii) The resolution of the imagery which is magnified from the 70mm diapositives appears to be lower than that which can be obtained on imagery produced directly from computer-compatible tapes. That is to say, there is a discernable loss of resolution on higher generations of material. The control point identification error will be further reduced during tests of geometric distortion by using, where possible, imagery of a lower generation number. To this end, it is intended that a TV monitor display, which is derived directly from a CCT, will be used to identify ground control points. Such a system has been developed by the Research School of Physical Sciences at the Australian National University (as was mentioned in the first Quarterly Report). Some modifications have been made to this system to enable the positions of points on the image to be read-off using a cursor. As image co-ordinates can be obtained (in terms of scan line numbers) distortion tests can be undertaken on what is virtually only second generation imagery.
- iv) Co-operation with the Australian National University in the use of their digital tape-manipulation equipment may eventually enable the production of CCT's to which distortion corrections have been applied. The CCT's may then be used in the preparation of maps from the imagery.
- (v) Aerial photography of some offshore regions (especially the Great Barrier Reef) may assist in the production of cartographic detail in any areas in which the first generation imagery is imperfect.

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III. Accomplishments

- i) An arrangement has been made whereby the Hydrographic Service, of the Royal Australian Navy, will obtain co-ordinates, where possible, of control points in the Great Barrier Reef. This would enable an attempt to be made at mapping a portion of the Reef using the LANDSAT-2 imagery. Twenty sites were selected on the basis of concepts presented in section II (ii) of this report from a LANDSAT-2 image (ID number 2213-23200). The positions of these points have been conveyed to the Hydrographic Service, who will attempt to relate these points to the mapping grid during a survey which is in progress at the time of preparation of this report. It is intended that the data will be used to prepare maps of this reef area by five different methods in an investigation of the various map production methods. To this end, a CCT of the same region (i.e. image 2213-23200) has been requested from EROS Data Centre.
- ii) In accordance with item II (iii), a geometric accuracy test of a LANDSAT image is now being undertaken using the TV monitor display equipment, other tests will follow if this initial test is successful.

IV. Significant Results

Two geometric distortion tests of the same scene using different ground control identification methods have produced different estimates of the magnitude of geometric distortions of the image frame. Consequently, the techniques described in II(i), to improve ground control point identification, will be implemented whenever possible.

A comparison of imagery with hydrographic charts in areas where these are available, shows that the imagery displays shoals, and reefs which are close to the water surface. This is an extremely useful property of the imagery. Such information can be used during the compilation of new maps of such regions, in the checking of existing hydrographic charts or for navigation warning. It is considered worth pursuing the possibility of producing maps from the imagery, as such valuable information can be obtained.

V. Publications

Nil

VI. Problems

Only very minor problems have been encountered.

The decision to use imagery of lower generation numbers, (as a consequence of the lower resolution on the 70mm diapositives), as mentioned in Section II, will necessitate the use of more complex methods of preparing the imagery for use. The production of the image film diapositive from a CCT within the Division of National Mapping will not be possible. It is emphasized that the 70mm 3rd generation imagery is of satisfactory quality for many purposes, including water depth determinations, where fine detail is not necessarily important.

The shortage of coverage of the Great Barrier Reef (i.e. test site no. 2) which is apparently due to persistent cloud coverage, has been disappointing. The greater density of oceanic features close to the water surface, has proved that this area is more suitable for the investigation than the test site no 1. Fortunately, it was possible to find a scene of the Great Barrier Reef region on which the map production processes are to be tested.

VII. Data Quality and Delivery

Data despatched and recorded since the last report has been as follows:

<u>Despatch</u>	<u>Number of scenes</u>
Oct 20	16
Nov 5	28
Nov 10	1
Nov 11	6
Nov 19	6
Nov 24	4
Dec 12	6

The low coverage of the test site no. 2 as mentioned in the previous Quarterly Report, has continued with the latter despatches of imagery.

A CCT which has been ordered for use with the mapping of portion of the Great Barrier Reef has not yet been received (ordered 19 December) so that no comment on this form of imagery can be made at this stage.

VIII. Recommendations

Because of the difficulty of finding water areas which appear to be suitable for depth determination and because of the likelihood that it will soon be possible to prepare a map of satisfactory planimetric accuracy, it is proposed that the investigation effort presently being applied to the determination of water depths would be reduced. This effort should be transferred to the preparation of geometrically accurate maps by the various possible methods. Such maps will display underwater features (see Section IV) even though it may not be possible to quote accurate depths.

IX. Conclusions

As mentioned in the last report, the image distortions appear to be of a magnitude which can be corrected to an extent which is satisfactory for our purposes. If the Hydrographic Service is able to place control in the Great Barrier Reef, it should be possible to prepare maps as part of an examination of various map production and distortion elimination processes. This stage of investigation will hinge on the receipt of data from the Hydrographic Service, and may be further reported in the third Quarterly Report. There has not been enough progress in the determination of mean water depths using the satellite imagery to enable the inclusion of bathymetric contours on the early maps.

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